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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/804,513

03/19/2004

Peng Zhang

06293P3 USA

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10/17/2006

AIR PRODUCTS AND CHEMICALS, INC.  
PATENT DEPARTMENT  
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EXAMINER

WEBB, GREGORY E

ART UNIT

PAPER NUMBER

1751

DATE MAILED: 10/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/804,513

Applicant(s)

ZHANG ET AL.

Examiner

Gregory E. Webb

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 03 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) 1-16,33 and 34 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed 8/3/06 have been fully considered but they are not persuasive. The applicant argues that no serious burden would be required to analyze the various groups. Here the examiner disagrees. Claim 1 is clearly directed to a process which would require specific attention to searching the substrate, process conditions and intended use. The applicant's elected group is directed to a process solution. Here the solution is the main feature of the invention and would not require the same degree of searching the substrate, process conditions and intended use. As such, the restriction is deemed proper.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002

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do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi, Masakazu (US4944893).

Concerning the semiconductor devices, photoresist, radiation source to form and the rinsing, Kobayashi, Masakazu teaches the following:

As is well known, the manufacturing process of **semiconductor devices** such as ICs and LSIs generally involves the successive steps in which a **substrate** of, for example, **semiconductor** silicon wafer is first provided on the surface with a thin film such as oxide film, then the surface is coated uniformly with a resist in the form of a solution to form a resinous layer sensitive to actinic rays, the resist layer is exposed **pattern**-wise to actinic rays followed by a development treatment to form a **patterned** resist layer, the underlying thin oxide film is subjected to **pattern**-wise etching with the **patterned** resist layer as the mask against etching and finally the **patterned** resist layer is removed completely. The resist having sensitivity to actinic rays implied in the present invention include **photoresists**, electron-beam resists, X-ray resists and the like. (*emphasis added*)

Concerning the exemplified surfactant, Kobayashi, Masakazu teaches the following:

Examples of suitable acetylene alcohol include 3-methyl-1-butyn-3-ol, 3-methyl-1-pentyn-3-ol, 2,5-3,6-dimethyl-4-octyn-3,6-diol, 2,4,7,9-tetramethyl-5-decyn -- 4,7-diol, 3,5-dimethyl-1-hexyn-3alcohols can be used either singly or as a combination of two kinds or more according to need. Among the above named acetylene alcohols, 3-methyl-1-butyn-3-ol and 3-methyl-1-pentyn-3-ol are particularly preferable in respect of the high effectiveness in achieving the object of the present invention. Several commercial products of acetylene alcohols are available including Surfynols and Olfines (products by Air Products and Chemicals Co., Inc.) as the preferable examples in respect of the availability. (*emphasis added*)

Concerning the exemplified second surfactant, 3,5-dimethyl-1-hexyn-3-ol and the dimethyl-1-hexyn-3-ol, Kobayashi, Masakazu teaches the following:

Surfynol 61: 3,5-**dimethyl-1-hexyn-3-ol**, a product by Air Products and Chemicals, Inc. (*emphasis added*)

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Concerning the non-aqueous solvent, Kobayashi, Masakazu teaches the following:

4. The remover composition for resist as claimed in claim 1 wherein the halogenated hydrocarbon compound is selected from the group consisting of 1,2,3-trichloropropane, dichloro**pentane**, hexyl chloride, 1,2-dibromoethane, chlorobenzene, 1,2-dichlorobenzene, trichlorobenzene, bromobenzene, 1,2-dibromobenzene and 2-chlorotoluene. (*emphasis added*)

Concerning the preferred solvents, Kobayashi, Masakazu teaches the following:

5. The remover composition for resist as claimed in claim 1 wherein the aromatic hydrocarbon compound is selected from the group consisting of **naphthalene**, methyl **naphthalene**, dimethyl **naphthalene**, tetrahydron**naphthalene**, dodecyl benzene, di(dodecyl)benzene, octyl benzene, decyl benzene, isopropyl **naphthalene** and diisopropyl **naphthalene**. (*emphasis added*)

Concerning the 2,4,7,9-tetramethyl-5-decyn-4,7-diol, Kobayashi, Masakazu teaches the following:

6. The remover composition for resist as claimed in claim 1 wherein the acetylene alcohol is selected from the group consisting of 3-methyl-1-butyn-3-ol, 3-methyl-1-pentyn-3-ol, 2,5- dimethyl-3-hexyn-2,5-diol, 3,6-dimethyl-4-octyn-3,6-diol, **2,4,7,9-tetramethyl-5-decyn-4,7-diol** and 3,5-dimethyl-1-hexyn- 3-ol. (*emphasis added*)

4. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Becknell, Alan F. (US5232815).

Concerning the reducing defects and the photoresist, Becknell, Alan F. teaches the following:

Further, it is generally recognized that the current resin/photoactive functionality combinations found in common **photoresists** are capable of resolving smaller features. On the other hand, the current liquid and dry film **photoresists** do not maximize those capabilities in that to form finer features with a good manufacturing yield it is generally recognized that thinner films with fewer **defects** than those provided by current liquid and dry film **photoresist** application methods are needed. However, other known application methods, such as lamination, roll coating, flood screen printing, spraying, dip coating, curtain coating, etc., fail as an appropriate application method as the film thickness decreases below 1 mil. For instance, in order to resolve features as small or smaller than 4 mils, which is currently the state of the art, it is preferable that the film thickness of the protective covering used be 25% or less of the feature size

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being resolved. However, when attempting to obtain thicknesses less than 1 mil with those methods, a significant number of **defects** begin to appear in the coating that results. (*emphasis added*)

Concerning the exemplified surfactant, Becknell, Alan F. teaches the following:

When using latices, a surfactant from the group described earlier may be used to emulsify components (i) and (ii) in order to assist the deposition process. A commercially available surfactant used in the Examples herein is Surfynol TG surfactant from Air Products, Inc. (*emphasis added*)

Concerning the radiation source to form and the developer solution, Becknell, Alan F. teaches the following:

Once either one of the resists have been applied to the surface, the surface is then exposed, to actinic **radiation**. When using the negative resist, the surface is exposed to **radiation** through a photographic negative bearing an image of the desired circuit. As a result, the sections of the resist exposed by the **radiation** become photopolymerized and thus less soluble in a **developer solution**. Then during the development phase, those sections of resist which were shielded from the **radiation**, and which thus remain substantially unpolymerized, are dissolved away by means of a suitable solvent that does not dissolve the photopolymerized sections. This stage is known as development because it develops an image of the circuit by uncovering certain sections of the metallic surface. After development, the uncovered metal surface is etched to form a printed circuit. The photopolymerized resist may then be stripped chemically by means of a solvent, leaving a circuit **pattern** formed from the unetched metal surface. (*emphasis added*)

Concerning the rinsing, Becknell, Alan F. teaches the following:

Specifically, circuit traces can be made by using either of two photoresist systems in a coating, imaging, developing and etching process. In the first system, the **substrates** or metallic surfaces are coated with a negative working photoresist which polymerizes upon exposure to actinic radiation. In the second system, the **substrate** or metallic surface is coated with a positive acting photoresist which becomes soluble in developer solution upon exposure to actinic radiation. (*emphasis added*)

Concerning the deionized water and the preferred solvents, Becknell, Alan F. teaches the following:

An emulsion was prepared from a solution of 25 g of Charkit PR-12 positive photoresist, a 2-diazo-1-naphthoquinone-5-sulfonate ester of a t-butyl phenol/formaldehyde resin and 25 g of **ethyl acetate** from Charkit. To the above solution was added 0.16 g Triton X-100, followed by dropwise addition of 25 g deionized (DI) water. A solution of 0.5 g polystep A 16-22 surfactant in 35 g DI water was added dropwise, followed by 20 g of DI Water and a further solution of 0.6 g Polystep A16-22 surfactant in 40 g DI water. A water-in-oil emulsion

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resulted. Addition of 1 g Triton X-100 in 5 g **ethyl acetate** resulted in an oil-in-water emulsion. The emulsion was sonicated for 2 minutes at about 180 W estimated intensity with a Sonics and Materials 500 cell disrupter with a 3/4 inch high gain Q horn. The low boiling **ethyl acetate** was removed on a rotary evaporator. The solids content of the emulsion was 17.5%. A deposition bath was prepared by diluting the emulsion to 8.4% total solids with water, adding an amount of phosphoric acid equal to 1% of the total bath weight and hydrogen peroxide equal to 1% of the total bath weight. A copper foil/epoxy glass laminate strip was immersed in the bath for 1 minute, and the resulting coating rinsed and dried. The coating was imagewise exposed through a positive pattern to UV light (90 mJ/cm.sup.2) and developed by immersion in a 5:1 dilution of a positive photoresist developer from MacDermid to give a coated pattern corresponding to the positive pattern. After heating at 150.degree. C. for 3 minutes, the patterned coating was sufficiently resistant to etching in a 10% CuCl.sub.2 /10% HCl bath at 60.degree. C. to etch the coating pattern into the underlying metal. (*emphasis added*)

Concerning the aqueous solvent and the 2,4,7,9-tetramethyl-5-decyn-4,7-diol, Becknell, Alan F. teaches the following:

Emulsion polymerization techniques, conditions and polymerization initiators are those well known in the art. Known techniques for the addition of monomers in emulsion polymerization techniques include continuous addition or sequential addition of monomer in separate portions. Known surfactants suitable for emulsifying the monomers in aqueous solution include, but are not limited to, **2,4,7,9-tetramethyl-5-decyn-4,7-diol**, 3,5-dimethyl-i-hexyn-3-ol, **glycerol** monostearate, dipropylene glycol monostearate, dipropylene glycol monolaurate, dipropylene glycol monooleate, pentaerythritol monooleate, sodium dioctyl sulfosuccinate, sorbitan monolaurate, sodium lauryl ether sulfate, potassium xylene sulfonate, sodium cumene sulfonate, ethylene glycol monostearate, **glycerol**, nonyl phenol ethoxylate, polyoxyethylene cetyl ether, N-octadecyl sulfosuccinamate, polypropylene glycol monostearate, 3,6-dimethyl-4-octyn-3,6-diol, dodecyl benzene sodium sulfonate, and sodium lauryl sulfate. When emulsion polymerization is used to prepare a bath, the surfactant used in the polymerization reaction may also serve as surfactant (v) of the emulsion. (*emphasis added*)

Concerning the methanol, Becknell, Alan F. teaches the following:

Other additives can also be included in the emulsion. The additives can be included as one of the original emulsion forming components or they can be added after the emulsion has been formed, depending on the additive used. Such additives include, but are not limited to, coalescing agents, stabilizers, pigments, flow aids and adhesion promoters. Commercially available stabilizers for negative photoactive functionalities include hydroquinone, p-methoxyphenol, pyrogallol, 2,6-di-t-butyl-4-methylphenol and phenothiazine. Available flow aids include Modaflow.RTM. from Monsanto and Lithene PL.RTM. from Rivertex. Available

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pigments and dyes include any of a wide variety, e.g. Neopen Blue 808.RTM. from BASF. Suitable coalescing agents are glycol ethers and esters such as PM Acetate.RTM. (propylene glycol monomethyl ether acetate) from Eastman Chemical Co. and Butyl Dipropasol.RTM. (dipropylene glycol monobutyl ether), Hexyl Carbitol.RTM. (hexyloxyethoxy **ethanol**) and UCAR.RTM. ester EEP (ethyl 3-ethoxy propionate) from Union Carbide. (*emphasis added*)

5. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Becknell, Alan F. (US5508141).

Concerning the reducing defects and the photoresist, Becknell, Alan F. teaches the following:

Further, it is generally recognized that the current resin/photoactive functionality combinations found in common **photoresists** are capable of resolving smaller features. On the other hand, the current liquid and dry film **photoresists** do not maximize those capabilities in that to form finer features with a good manufacturing yield it is generally recognized that thinner films with fewer **defects** than those provided by current liquid and dry film **photoresist** application methods are needed. However, other known application methods, such as lamination, roll coating, flood screen printing, spraying, dip coating, curtain coating, etc., fail as an appropriate application method as the film thickness decreases below 1 mil. For instance, in order to resolve features as small or smaller than 4 mils, which is currently the state of the art, it is preferable that the film thickness of the protective covering used be 25% or less of the feature size being resolved. However, when attempting to obtain thicknesses less than 1 mil with those methods, a significant number of **defects** begin to appear in the coating that results. (*emphasis added*)

Concerning the exemplified surfactant, Becknell, Alan F. teaches the following:

When using latices, a surfactant from the group described earlier may be used to emulsify components (i) and (ii) in order to assist the deposition process. A commercially available surfactant used in the Examples herein is Surfynol TG surfactant from Air Products, Inc. (*emphasis added*)

Concerning the exemplified second surfactant, aqueous solvent, 3,5-dimethyl-1-hexyn-3-ol, 2,4,7,9-tetramethyl-5-decyn-4,7-diol and the dimethyl-1-hexyn-3-ol, Becknell, Alan F. teaches the following:

Emulsion polymerization techniques, conditions and polymerization initiators are those well known in the art. Known techniques for the addition of monomers in emulsion polymerization techniques include continuous addition or sequential



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addition of monomer in separate portions. Known surfactants suitable for emulsifying the monomers in aqueous solution include, but are not limited to, **2,4,7,9-tetramethyl-5-decyn-4,7-diol**, **3,5-dimethyl-1-hexyn-3-ol**, **glycerol** monostearate, dipropylene glycol monostearate, dipropylene glycol monolaurate, dipropylene glycol monooleate, pentaerythritol monooleate, sodium dioctyl sulfosuccinate, sorbitan monolaurate, sodium lauryl ether sulfate, potassium xylene sulfonate, sodium cumene sulfonate, ethylene glycol monostearate, **glycerol**, nonyl phenol ethoxylate, polyoxyethylene cetyl ether, N-octadecyl sulfosuccinamate, polypropylene glycol monostearate, 3,6-dimethyl-4-octyn-3,6-diol, dodecyl benzene sodium sulfonate, and sodium lauryl sulfate. When emulsion polymerization is used to prepare a bath, the surfactant used in the polymerization reaction may also serve as surfactant (v) of the emulsion. (*emphasis added*)

Concerning the radiation source to form and the developer solution, Becknell, Alan F. teaches the following:

Once either one of the resists have been applied to the surface, the surface is then exposed to actinic **radiation**. When using the negative resist, the surface is exposed to **radiation** in an image-wise fashion, e.g. through a photographic negative bearing an image of the desired circuit. As a result, the sections of the resist exposed by the **radiation** become photopolymerized and thus less soluble in a **developer solution**. Then during the development phase, those sections of resist which were shielded from the **radiation**, and which thus remain substantially unpolymerized, are dissolved away by means of a suitable solvent that does not dissolve the photopolymerized sections. This stage is known as development because it develops an image of the circuit by uncovering certain sections of the metallic surface. After development, the uncovered metal surface is etched to form a printed circuit. The photopolymerized resist may then be stripped chemically by means of a solvent, leaving a circuit **pattern** formed from the unetched metal surface. (*emphasis added*)

Concerning the rinsing, Becknell, Alan F. teaches the following:

Specifically, circuit traces can be made by using either of two photoresist systems in a coating, imaging, developing and etching process. In the first system, the **substrates** or metallic surfaces are coated with a negative working photoresist which polymerizes upon exposure to actinic radiation. In the second system, the **substrate** or metallic surface is coated with a positive acting photoresist which becomes soluble in developer solution upon exposure to actinic radiation. (*emphasis added*)

Concerning the deionized water and the preferred solvents, Becknell, Alan F. teaches the following:

An emulsion was prepared from a solution of 25 g of a Charkit PR-12 positive photoresist, a 2-diazo-1-naphthoquinone-5-sulfonate ester of a t-butyl phenol/formaldehyde resin and 25 g of **ethyl acetate** from Charkit. To the above

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solution was added 0.16 g Triton X-100, followed by dropwise addition of 25 g deionized (DI) water. A solution of 0.5 g Polystep A 16-22 surfactant in 35 g DI water was added dropwise, followed by 20 g of DI water and a further solution of 0.6 g Polystep A16-22 surfactant in 40 g DI water. A water-in-oil emulsion resulted. Addition of 1 g Triton X-100 in 5 g **ethyl acetate** resulted in an oil-in-water emulsion. The emulsion was sonicated for 2 minutes at about 180W estimated intensity with a Sonics and Materials 500 cell disrupter with a 3/4 inch high gain Q horn. The low boiling **ethyl acetate** was removed on a rotary evaporator. The solids content of the emulsion was 17.5%. A deposition bath was prepared by diluting the emulsion to 8.4% total solids with water, adding an amount of phosphoric acid equal to 1% of the total bath weight and hydrogen peroxide equal to 1% of the total bath weight. A copper foil/epoxy glass laminate strip was immersed in the bath for 1 minute, and the resulting coating rinsed and dried. The coating was imagewise exposed through a positive pattern to UV light (90 mJ/cm.sup.2) and developed by immersion in a 5:1 dilution of a positive photoresist developer from MacDermid to give a coated pattern corresponding to the positive pattern. After heating at 150.degree. C. for 3 minutes, the patterned coating was sufficiently resistant to etching in a 10% CuCl.sub.2 /10% HCl bath at 60.degree. C. to etch the coating pattern into the underlying metal. (*emphasis added*)

Concerning the methanol, Becknell, Alan F. teaches the following:

Other additives can also be included in the emulsion. The additives can be included as one of the original emulsion forming components or they can be added after the emulsion has been formed, depending on the additive used. Such additives include, but are not limited to, coalescing agents, stabilizers, pigments, flow aids and adhesion promoters. Commercially available stabilizers for negative photoactive functionalities include hydroquinone, p-methoxyphenol, pyrogallol, 2,6-di-t-butyl-4-methylphenol and phenothiazine. Available flow aids include Modaflow.RTM. from Monsanto and Lithene PL.RTM. from Rivertex. Available pigments and dyes include any of a wide variety, e.g. Neopen Blue 808.RTM. from BASF. Suitable coalescing agents are glycol ethers and esters such as PM Acetate.RTM. (propylene glycol monomethyl ether acetate) from Eastman Chemical Co. and Butyl Dipropasol.RTM. (dipropylene glycol monobutyl ether), Hexyl Carbitol.RTM. (hexyloxyethoxy **ethanol**) and UCAR.RTM. ester EEP (ethy13-ethoxy propionate) from Union Carbide. (*emphasis added*)

Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Medina, Steven Wayne (US5650543).

Concerning the reducing defects, Medina, Steven Wayne teaches the following:

an ability to provide a reduction in coating or printing **defects** such as orange peel and flow/leveling deficiencies; (*emphasis added*)

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Concerning the acetylenic diol and the preferred solvents, Medina, Steven Wayne teaches the following:

This invention relates to ethoxylated acetylenic glycol compositions represented by the formula: ##STR1## wherein m and n are integers and the sum is from 4-12. These ethoxylated **acetylenic diols** are excellent as surfactants alone or admixed with other surfactants for use in water borne coatings.

*(emphasis added)*

Concerning the exemplified surfactant, Medina, Steven Wayne teaches the following:

The surfactants of this invention are ethoxylates of **2,5,8,11-tetramethyl-6-dodecyne-5,8-diol**. These ethoxylates, because of their ability to decrease the surface tension of aqueous systems, have wide utility in formulating coating and ink formulations. The moles ethoxylate per mole of acetylenic glycol range from 2-50, preferably 3-10 and most preferably 4-7. When the moles ethoxylate ranges below the lower end of the scale, and when the ethoxylate ranges above the upper end of the scale, properties of the aqueous system may deteriorate. *(emphasis added)*

Concerning the rinsing, Medina, Steven Wayne teaches the following:

an ability to produce water borne coatings and inks which may be applied to a variety of **substrates** with excellent wetting of **substrate** surfaces including contaminated and low energy surfaces; *(emphasis added)*

Concerning the deionized water, Medina, Steven Wayne teaches the following:

In an article, Schwartz, The Importance of Low Dynamic Surface Tension in Waterborne Coatings, Journal of Coatings Technology (1992), there is discussion of surface tension properties in waterborne coatings and a discussion of dynamic surface tension in such coatings. Equilibrium surface and dynamic surface tension are evaluated for several surface active agents including the ethyleneoxide adducts of acetylenic glycol, e.g., the 4,7-ethyleneoxide the 3.5 mole adduct of 2,4,7,9-tetramethyl-5-decyne-4,7-diol where the number of ethyleneoxide units ranges from about 1.3 to 30, as well as the acetylenic glycols themselves, and ethyleneoxide adducts of other aromatic and aliphatic alcohols, e.g., nonylphenol and lauryl alcohol. At a concentration of 0.1% in **distilled water**, the dynamic surface tension ranges from a low of about 32 to a high of 72 dynes per centimeter. *(emphasis added)*

Concerning the 2,4,7,9-tetramethyl-5-decyne-4,7-diol, Medina, Steven Wayne teaches the following:

Surfactants based on acetylenic glycols such as **2,4,7,9-tetramethyl-5-decyne-4,7-diol** and its ethoxylates are known for their good balance of equilibrium and

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dynamic surface tension reducing capabilities with little of the negative features of traditional nonionic and anionic surfactants. The molecules, however, may not provide the very low surface tension reduction needed for the wetting of contaminated surfaces or low surface energy substrates. In those cases, end-users may require silicone or fluorocarbon based surfactants which may be costly, foamy, exhibit poor dynamic performance and often cause adhesion problems. (*emphasis added*)

6. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Medina, Steven Wayne (US5650543).

Concerning the reducing defects, Medina, Steven Wayne teaches the following:

an ability to provide a reduction in coating or printing **defects** such as orange peel and flow/leveling deficiencies; (*emphasis added*)

Concerning the acetylenic diol and the preferred solvents, Medina, Steven Wayne teaches the following:

This invention relates to ethoxylated acetylenic glycol compositions represented by the formula: ##STR1## wherein m and n are integers and the sum is from 4-12. These ethoxylated **acetylenic diols** are excellent as surfactants alone or admixed with other surfactants for use in water borne coatings.

(*emphasis added*)

Concerning the exemplified surfactant, Medina, Steven Wayne teaches the following:

The surfactants of this invention are ethoxylates of **2,5,8,11-tetramethyl-6-dodecyne-5,8-diol**. These ethoxylates, because of their ability to decrease the surface tension of aqueous systems, have wide utility in formulating coating and ink formulations. The moles ethoxylate per mole of acetylenic glycol range from 2-50, preferably 3-10 and most preferably 4-7. When the moles ethoxylate ranges below the lower end of the scale, and when the ethoxylate ranges above the upper end of the scale, properties of the aqueous system may deteriorate. (*emphasis added*)

Concerning the rinsing, Medina, Steven Wayne teaches the following:

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an ability to produce water borne coatings and inks which may be applied to a variety of **substrates** with excellent wetting of **substrate** surfaces including contaminated and low energy surfaces; (*emphasis added*)

Concerning the deionized water, Medina, Steven Wayne teaches the following:

In an article, Schwartz, The Importance of Low Dynamic Surface Tension in Waterborne Coatings, Journal of Coatings Technology (1992), there is discussion of surface tension properties in waterborne coatings and a discussion of dynamic surface tension in such coatings. Equilibrium surface and dynamic surface tension are evaluated for several surface active agents including the ethyleneoxide adducts of acetylenic glycol, e.g., the 4,7-ethyleneoxide the 3.5 mole adduct of 2,4,7,9-tetramethyl-5-decyne-4,7-diol where the number of ethyleneoxide units ranges from about 1.3 to 30, as well as the acetylenic glycols themselves, and ethyleneoxide adducts of other aromatic and aliphatic alcohols, e.g., nonylphenol and lauryl alcohol. At a concentration of 0.1% in **distilled water**, the dynamic surface tension ranges from a low of about 32 to a high of 72 dynes per centimeter. (*emphasis added*)

Concerning the 2,4,7,9-tetramethyl-5-decyne-4,7-diol, Medina, Steven Wayne teaches the following:

Surfactants based on acetylenic glycols such as **2,4,7,9-tetramethyl-5-decyne-4,7-diol** and its ethoxylates are known for their good balance of equilibrium and dynamic surface tension reducing capabilities with little of the negative features of traditional nonionic and anionic surfactants. The molecules, however, may not provide the very low surface tension reduction needed for the wetting of contaminated surfaces or low surface energy substrates. In those cases, end-users may require silicone or fluorocarbon based surfactants which may be costly, foamy, exhibit poor dynamic performance and often cause adhesion problems. (*emphasis added*)

7. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Barnes, Jeff (US6194366).

Concerning the reducing defects, Barnes, Jeff teaches the following:

Sample 200 mm TEOS wafers (non-copper containing) were pre-cleaned using a scrubber. Defects were measured on a Tencor 6400; all wafers had <100 **defects** at 0.2 .mu.m. Three separate series of performance tests were conducted using a different commercially-available CMP slurry composition to contaminate the wafers: (*emphasis added*)

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Concerning the semiconductor devices, Barnes, Jeff teaches the following:

The present day fabrication of **semiconductor devices** is a complex, multi-step process. The CMP process is now a well established enabling technology used by most advanced **semiconductor** operations for planarization (or "polishing") of various substrates for production of devices with design geometries less than 0.35 micron. (*emphasis added*)

Concerning the exemplified surfactant, Barnes, Jeff teaches the following:

Solution F: Solution E, further containing 0.2 wt % of a surfactant (**Surfynol 420; Air Products**) (*emphasis added*)

Concerning the rinsing, Barnes, Jeff teaches the following:

A cleaning solution for cleaning copper-containing microelectronic **substrates** following CMP processing is provided. Cleaning copper-containing **substrates** following CMP processing is generally referred to as "post-Cu CMP" or "post-CMP copper clean". A "copper-containing microelectronic **substrate**" is understood herein to refer to a **substrate** surface manufactured for use in microelectronic, integrated circuit, or computer chip applications, wherein the **substrate** contains copper-containing components. Copper-containing components may include, for example, metallic interconnects that are predominately copper or copper alloy. It is understood that the microelectronic surface may also be composed of semiconductor materials, such as TiN, Ta, TiW (as copper diffusion barrier metals), and silica. Generally, a copper-containing microelectronic **substrate** contains about 1-20% Cu, including the copper interconnects. (*emphasis added*)

Concerning the deionized water, Barnes, Jeff teaches the following:

"Dip tests" were conducted using precleaned Fisher 12-550-10 glass microscope slides. In the following procedures, all dips were undertaken for 5 sec., and handled with plastic forceps. A sample slide was first dipped into a CMP oxide slurry (Ultraplane P-1500), then dipped into 250 ml of **deionized water**, and then into a W-CMP slurry (1:1 dilution of Ultraplane-MC W CMP base and **deionized water**). Each slide was then dipped into 250 ml **deionized water**, then into the subject cleaning solution. Each slide was then dipped into 100 ml **deionized water**, then dipped into another separate **deionized water** bath. The slides were hung to air dry under ambient conditions. Between each test, all **deionized water** baths were replaced. (*emphasis added*)

Concerning the preferred solvents, Barnes, Jeff teaches the following:

Nam, U.S. Pat. No. 5,863,344, discloses a cleaning solution for semiconductor devices containing tetramethyl ammonium hydroxide, **acetic acid**, and water. The solution preferably contains a volumetric ratio of **acetic acid** to tetramethyl ammonium hydroxide ranging from about 1 to about 50. (*emphasis added*)

Concerning the methanol and the TMAH, Barnes, Jeff teaches the following:

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A cleaning solution for cleaning copper-containing microelectronic substrates comprises a quaternary ammonium hydroxide selected from the group consisting of **tetramethylammonium** hydroxide, tetraethylammonium hydroxide, trimethylethylammonium hydroxide, and combinations thereof; an organic amine selected from the group consisting of mono**ethanolamine**, aminoethyle**thanolamine**, -methylamino**ethanol**, aminoethoxy**ethanol**, di**ethanolamine**, tri**ethanolamine**, C.sub.1 -C.sub.5 alkanolamines, and combinations thereof; a corrosion inhibitor selected from the group consisting of gallic acid, catechol, pyrogallol, resorcinol, hydroquinone, benzotriazole, and combinations thereof; and water. The pH of the solution is greater than 10. (*emphasis added*)

8. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi, Masakazu (US6261745).

Concerning the semiconductor devices, photoresist, radiation source to form and the methanol, Kobayashi, Masakazu teaches the following:

Semiconductor devices such as ICs and LSIs as well as liquid-crystal panel devices are fabricated by a process comprising the following steps: forming a conductive metallic layer or an insulating layer such as an SiO.sub.2 film by CVD onto a substrate; applying a uniform **photoresist** layer over the metallic or insulating layer; selectively exposing the applied **photoresist** layer to light and developing the exposed layer to form a **photoresist pattern**; selectively etching the above-mentioned conductive metallic layer or insulating layer through the **photoresist pattern** as a mask **pattern** to form a fine-line circuit; and stripping away the remaining **photoresist** layer which is not necessary any longer. For the removal of such an unnecessary **photoresist** layer, a stripping agent that contains an organic amine as an essential ingredient, such as, for example, mono**ethanolamine**, is commonly used today, because of its effectiveness in removing **photoresists**, and further for safety reasons. (*emphasis added*)

Concerning the exemplified surfactant, Kobayashi, Masakazu teaches the following:

The compound as component (d) is known per se as a surfactant. It is commercially available under trade names of "Surfynol" series (products of Air Product and Chemicals Inc.) and "Acetylenol" series (products of Kawaken Fine Chemicals Co., Ltd.). Preferable among these products are "Surfynol 440" (n+m=3.5), "Surfynol 465" (n+m=10), "Surfynol 485" (n+m=30), "Acetylenol EL" (n+m=4), and "Acetylenol EH" (n+m=10), or mixtures thereof, in view of their water solubility and surface tension. A mixture of "Acetylenol EL" and

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"Acetylenol EH" in a ratio of from 2:8 to 4:6 (by weight) is particularly desirable.  
(*emphasis added*)

Concerning the developer solution and the rinsing, Kobayashi, Masakazu teaches the following:

Next, patterning development is carried out by using a photoresist **developer** and thus the desired photoresist pattern can be obtained. The development may be effected by an arbitrary method without restriction. Use may be made of any method appropriate for the purpose: an immersion development method which comprises immersing the **substrate** having the photoresist applied thereonto in a **developer** for a definite time followed by washing with water and drying; a paddle development method which comprises dropping a **developer** onto the surface of the photoresist applied onto the **substrate** and allowing it to stand for a definite time followed by washing with water and drying; and a spray development method which comprises spraying a **developer** onto the surface of the photoresist followed by washing with water and drying. (*emphasis added*)

Concerning the aqueous solvent and the preferred solvents, Kobayashi, Masakazu teaches the following:

Examples of water-soluble organic solvents include: sulfoxides, such as dimethyl sulfoxide; sulfones, such as dimethyl sulfone, diethyl sulfone, bis(2-hydroxyethyl)sulfone and tetramethylene sulfone; amides, such as N,N-dimethyl**formamide**, N-methyl**formamide**, N,N-dimethyl**acetamide**, N-methylacetamide and N,N-diethylacetamide; lactams, such as N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, N-propyl-2-pyrrolidone, N-hydroxymethyl-2-pyrrolidone and N-hydroxyethyl-2-pyrrolidone; imidazolidinones, such as 1,3-dimethyl-2-imidazolidinone, 1,3-diethyl-2-imidazolidinone and 1,3-diisopropyl-2-imidazolidinone; lactones, such as .gamma.-butyrolactone and .delta.-valerolactone; and polyhydric alcohols, such as ethylene glycol, ethylene glycol **monomethyl ether**, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol **monomethyl ether** acetate, ethylene glycol monoethyl ether acetate, diethylene glycol, diethylene glycol **monomethyl ether**, diethylene glycol monoethyl ether and diethylene glycol monobutyl ether, and derivatives thereof. These organic solvents may be used alone or in combination with one another. Preferable among these examples are dimethylsulfoxide, N,N-dimethyl**formamide**, N,N-dimethyl**acetamide**, N-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, ethylene glycol and diethylene glycol monobutyl ether, which effectively remove modified photoresist films. Of these examples, dimethyl sulfoxide is particularly desirable because of its good anticorrosive effect on substrates. (*emphasis added*)

Concerning the TMAH, Kobayashi, Masakazu teaches the following:

The thus formed substrate was spin-coated with a positive-working photoresist comprising naphthoquinone diazide compound and novolak resin ("THMR-iP3300" of Tokyo Ohka Kogyo Co., Ltd.). Then, it was prebaked at 90.degree. C. for 90 seconds, so that there was obtained a 0.2-.mu.m thick photoresist layer.



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After that, the photoresist layer was exposed through a mask pattern using NSR-2005i10D (a product of Nikon Corporation). The exposed photoresist was developed with an aqueous solution of 2.38 wt % **tetramethylammonium hydroxide (TMAH)**. The resulting photoresist pattern underwent post-baking at 120.degree. C. for 90 seconds. (*emphasis added*)

9. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Lassila, Kevin Rodney (US6313182).

Concerning the reducing defects and the preferred solvents, Lassila, Kevin Rodney teaches the following:

The data in Table 8 show that while propoxylation has little impact on the surface tension performance of the 5.1 mole ethoxylate of 2,4,7,9-tetramethyl-5-decyne-4,7-diol, it has a significant positive impact on foam control, with greater control observed with higher degrees of propoxylation. Such an effect has not previously been observed with alkoxylated derivatives of acetylenic **diols**. The ability to control foam is of crucial importance in the application of many waterborne formulations, because foam generally leads to **defects**. (*emphasis added*)

Concerning the acetylenic diol, exemplified surfactant and the 2,4,7,9-tetramethyl-5-decyne-4,7-diol, Lassila, Kevin Rodney teaches the following:

With respect to the processes for the preparation of **acetylenic diol** EO/PO adducts, the tertiary **acetylenic diol** starting materials can be prepared in various known manners such as those described in U.S. Pat. Nos. 2,250,445; 2,106,180 and 2,163,720, which are incorporated by reference. The **acetylenic diol** starting material may contain from 8 to 26 carbons. It is preferred that the acetylenic diol starting material contain 14 to 16 carbons, and it is most particularly preferred that it be **2,4,7,9-tetramethyl-5-decyne-4,7-diol** or **2,5,8,11-tetramethyl-6-dodecyne-5,8-diol**. (*emphasis added*)

Concerning the developer solution, Lassila, Kevin Rodney teaches the following:

JP 2569377 B2 discloses a recording material containing dispersions of a substantially colorless electron donating dye precursor and a **developer**. When at least one of these dispersions is prepared, at least one of the compounds **##STR9##** (*emphasis added*)

Concerning the rinsing, Lassila, Kevin Rodney teaches the following:

an ability to formulate water-borne compositions which may be applied to a variety of **substrates** with excellent wetting of **substrate** surfaces including contaminated and low energy surfaces; (*emphasis added*)

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Concerning the deionized water, Lassila, Kevin Rodney teaches the following:

Solutions in **distilled water** of the materials of Examples 37-52 were prepared and their surface tension and foam performance were evaluated as in the example above. The results are set forth in the Table 7. (*emphasis added*)

Concerning the aqueous solvent and the methanol, Lassila, Kevin Rodney teaches the following:

To prepare the EO/PO adducts of the invention, the acetylenic glycol is liquefied by melting and the catalyst is added with stirring. Ethylene oxide and/or propylene oxide are added as liquids with stirring and the reaction is concluded when the desired polyalkylene oxide chain length is reached as determined by gel permeation chromatography (GPC), high performance liquid chromatography (HPLC), nuclear magnetic resonance (NMR), cloud point (ASTM D2024-65) or water titration of an **isopropyl alcohol** solution. No solvents are necessary during the reaction, but inert solvents such as aromatic hydrocarbons (benzene and toluene) and ethers (ethyl ether) may be used to facilitate handling. In some instances it may be convenient to use a low mole ethoxylated acetylenic diol, since these products are liquids and are therefore easy to handle. (*emphasis added*)

10. Claims 17-32 rejected under 35 U.S.C. 102(e) as being anticipated by Ann, Paula (US20020106589).

Concerning the reducing defects, photoresist, radiation source to form, developer solution and the rinsing, Ann, Paula teaches the following:

[0092] Briefly, the process for manufacture of integrated circuits involves the application of a film of **photoresist** composition to a suitable **substrate**, such as a silicon wafer, which is then exposed to actinic **radiation** in a designed **pattern** that is imposed upon the **photoresist** film. Depending upon whether the **photoresist** is positive or negative-working, the **radiation** either increases or decreases its solubility in a subsequently applied **developer solution**. Consequently, in a positive-working **photoresist** the areas masked from the **radiation** remain after development while the exposed areas are dissolved away. In the negative-working **photoresist** the opposite occurs. The surfactant of this invention can be used in **developers** for either type of **photoresist**. The character of the **developer** is very important in determining the quality of the circuits formed and precise control of developing is essential. To achieve better surface wetting by the **developer** it has been common to add surfactant to the formulation in order to reduce surface tension of the solution. This addition, however, can cause the **developer** to foam which leads to circuit **defects**. This foaming problem

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is also recognized in the art and considerable attention in the industry has been directed toward its solution. (*emphasis added*)

Concerning the semiconductor devices and the acetylenic diol, Ann, Paula teaches the following:

[0090] Other compositions in which use of the **acetylenic diol** EO/PO adduct as a surfactant is particularly advantageous are the developers for photoresists that are employed in the **semiconductor** industry. Such developers and their use are well known in the art and do not need to be described in detail. In fact, as pointed out in the background section of this disclosure, the use of ethoxylated **acetylenic diol** adducts in such formulations is known and well documented. The improvement provided by this invention, which could not have been foreseen, involves the use in these developer formulations of certain **acetylenic diol** adducts which also contain propoxy groups. (*emphasis added*)

Concerning the exemplified surfactant, Ann, Paula teaches the following:

[0094] This example illustrates that two mole propoxylates of acetylenic diol ethoxylates can be prepared with high selectivity when using trialkylamine catalysts. In this example, the preparation of the 7 mole propoxylate of Surfynol.RTM. 465 surfactant, which is the 10 mole ethoxylate of 2,4,7,9-tetramethyl-4-decyne-4,7-diol, was attempted. (*emphasis added*)

Concerning the Pluronic L121, Ann, Paula teaches the following:

19TABLE 14 Foam Volume (mL) OCG Time 934 MF- MF- (min) Ex. 4 Ex. 31  
3:2.sup.a 702.sup.b 319.sup.b 10R5.sup.c 17R2.sup.c L31.sup.c 0 0.0 0.0 0.0 0.0  
0.0 0.0 0.0 0.0 1 7.8 7.5 15.6 39.5 51.1 20.5 15.4 20.2 2 7.2 7.5 17.2 72.6 91.4  
21.1 16.2 20.5 3 7.1 7.5 24.2 107.4 135.3 22.6 16.7 21.4 4 7.2 7.5 22.9 156.4  
176.8 21.7 16.9 21.1 5 7.2 7.5 22.3 172.8 237.8 22.3 16.5 21.4 6 7.3 7.5 22.0  
236.2 275.1 22.6 16.9 22.3 7 7.1 7.5 25.8 287.0 321.3 22.6 16.9 21.7 8 7.1 7.5  
25.8 307.6 372.6 22.0 17.4 22.0 9 7.1 7.5 25.5 326.9 416.7 22.9 17.2 22.0 10 7.5  
7.5 26.2 301.3 460.6 22.6 17.4 22.3 11 7.7 7.5 26.5 340.2 502.0 22.3 17.6 22.6 12  
7.9 7.5 26.9 404.8 544.9 22.0 17.4 22.3 13 7.8 7.5 26.9 438.6 594.7 22.6 17.6 22.6  
14 7.9 7.5 26.9 488.6 647.5 22.0 17.6 22.3 15 7.8 7.5 27.3 514.9 681.1 22.3 18.1  
22.6 .sup.aCommercial developer solution from Olin (now Arch Chemical)  
.sup.bCommercial developer marketed under Microposist .RTM. trademark by  
Shipley .sup.cCommercial surfactant marketed under Pluronic .RTM. trademark  
by BASF (*emphasis added*)

Concerning the deionized water, Ann, Paula teaches the following:

[0118] Solutions in **distilled water** of the materials of Examples 37-52 were prepared and their surface tension and foam performance were evaluated as in the example above. The results are set forth in the Table 7. (*emphasis added*)

Concerning the aqueous solvent and the methanol, Ann, Paula teaches the following:

[0076] To prepare the EO/PO adducts of the invention, the acetylenic glycol is liquefied by melting and the catalyst is added with stirring. Ethylene oxide and/or propylene oxide are added as liquids with stirring and the reaction is concluded

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when the desired polyalkylene oxide chain length is reached as determined by gel permeation chromatography (GPC), high performance liquid chromatography (HPLC), nuclear magnetic resonance (NMR), cloud point (ASTM D2024-65) or water titration of an **isopropyl alcohol** solution. No solvents are necessary during the reaction, but inert solvents such as aromatic hydrocarbons (benzene and toluene) and ethers (ethyl ether) may be used to facilitate handling. In some instances it may be convenient to use a low mole ethoxylated acetylenic diol, since these products are liquids and are therefore easy to handle. (*emphasis added*)

Concerning the preferred solvents, Ann, Paula teaches the following:

[0035] JP 03063187 A discloses the use of acetylenic glycol ethylene oxide and/or propylene oxide addition products in concentrated aqueous fountain solution compositions for offset printing. In one example, the 8 to 12 mole ethylene oxide/1 to 2 mole propylene oxide adduct of 3,5-dimethyl-4-octyne-3,5-diol is used in a fountain solution. Other examples illustrate the use of only ethylene oxide derivatives of acetylenic **diols**. (*emphasis added*)

Concerning the TMAH, Ann, Paula teaches the following:

[0135] Foam tests were made in **TMAH** developer solutions formulated with the EO/PO adduct of Example 4 and the EO adduct of Example 31 as surfactants and with six commercial developer solutions containing surfactants. Data were collected utilizing a foam generating apparatus whereby nitrogen gas was passed through a frit and bubbled through 100 mL of the solutions at 50 mL/min. Except for the commercial developer solutions which were used as received, all solutions contained 2.4 wt % **TMAH** in water with enough surfactant to lower surface tension to 41-43 dyne/cm. The results are given in Table 14. (*emphasis added*)

Concerning the 2,4,7,9-tetramethyl-5-decyne-4,7-diol, Ann, Paula teaches the following:

[0099] Example 3 illustrates the preparation of the 3.5 mole ethoxylate of **2,4,7,9-tetramethyl-5-decyne-4,7-diol** capped with 2 moles of propylene oxide using trimethylamine catalyst and a preformed ethoxylate. The 3.5 mole ethoxylate of **2,4,7,9-tetramethyl-5-decyne-4,7-diol** is commercially available from Air Products and Chemicals, Inc. and is marketed as Surfynol.RTM. 440 surfactant. (*emphasis added*)

11. Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Boinowitz, Tammo (US6552091).

Concerning the reducing defects, Boinowitz, Tammo teaches the following:

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Particularly suitable for this purpose are alkylphenol ethoxylates or fatty alcohol alkoxylates, which also contribute to steric stabilization of dispersed pigment states. The high-performance alkylphenol ethoxylates have come under criticism on ecotoxicological grounds, and their use in laundry detergents and cleaning products is already banned in many countries. Similar bans may be expected for the paint and printing inks industry. Fatty alcohol ethoxylates in many cases fail to achieve the good properties of the alkylphenol-ethoxylates. Since they lack groups capable of adsorption, the pigment wetting properties are less pronounced. Moreover, the nonadsorbed portion of this product group, in particular, has the undesirable effect of stabilizing the foam, which can be suppressed only with the aid of substances having a strong defoaming action, which, in turn, induce other adverse phenomena, such as unwanted surface **defects**. The use of numerous dispersing additives also has a negative impact on the water resistance or light stability of coatings. (*emphasis added*)

Concerning the exemplified surfactant and the SURFYNOL.RTM. 2502, Boinowitz, Tammo teaches the following:

Block polyalkylene oxides of this kind, containing for example from about 1.0 to about 1.9 mol of styrene oxide, are not known. They are highly active surfactants, especially highly active emulsifiers, and as such are ideally suited, for example, to the preparation of emulsion polymers. The block-copolymeric poly-alkylene oxides of the invention may be used alone or in combination. In some cases it is also advantageous to combine these polyalkylene oxides with other, prior art ionic or nonionic surfactants. In particular, in order to prepare low-foam pigment pastes, combination with acetylenediol surfactants, such as **2,4,7,9-tetramethyldecynediol (Surfynol.RTM. 104, Air Products)**, is particularly advisable. (*emphasis added*)

Concerning the exemplified second surfactant, Boinowitz, Tammo teaches the following:

**(2,6-dimethyl-4-heptanol(SO).sub.1 (EO).sub.9 (BO).sub.1 H;** (*emphasis added*)

Concerning the aqueous solvent and the preferred solvents, Boinowitz, Tammo teaches the following:

It is known in the art that fatty alcohol polyglycol **ethers** are substances which are prepared on the industrial scale primarily by addition reaction of ethylene oxide and/or propylene oxide in the presence of acidic or basic catalysts of the prior art, preferably under pressure and at elevated temperature. Depending on the nature of the catalyst used, the products may have a more or less narrowed homolog distribution. (*emphasis added*)

12. Claims 17-32 rejected under 35 U.S.C. 102(e) as being anticipated by Lee, Won-Mok (US20040071967).

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Concerning the reducing defects, photoresist, radiation source to form, developer solution and the rinsing, Lee, Won-Mok teaches the following:

[0072] Briefly, the process for manufacture of integrated circuits involves the application of a film of **photoresist** composition to a suitable **substrate**, such as a silicon wafer, which is then exposed to actinic **radiation** in a designed **pattern** that is imposed upon the **photoresist** film. Depending upon whether the **photoresist** is positive or negative-working, the **radiation** either increases or decreases its solubility in a subsequently applied **developer solution**. Consequently, in a positive-working **photoresist** the areas masked from the **radiation** remain after development while the exposed areas are dissolved away. In the negative-working **photoresist** the opposite occurs. The surfactant of this invention can be used in **developers** for either type of **photoresist**. The character of the **developer** is very important in determining the quality of the circuits formed and precise control of developing is essential. To achieve better surface wetting by the **developer** it has been common to add surfactant to the formulation in order to reduce surface tension of the solution. This addition, however, can cause the **developer** to foam which leads to circuit **defects**. This foaming problem is also recognized in the art and considerable attention in the industry has been directed toward its solution. (*emphasis added*)

Concerning the semiconductor devices and the acetylenic diol, Lee, Won-Mok teaches the following:

[0070] Other compositions in which use of the **acetylenic diol** EO/PO adduct as a surfactant is particularly advantageous are the developers for photoresists that are employed in the **semiconductor** industry. Such developers and their use are well known in the art and do not need to be described in detail. In fact, as pointed out in the background section of this disclosure, the use of ethoxylated **acetylenic diol** adducts in such formulations is known and well documented. The improvement provided by this invention, which could not have been foreseen, involves the use in these developer formulations of certain **acetylenic diol** adducts which also contain propoxy groups. (*emphasis added*)

Concerning the exemplified surfactant, Lee, Won-Mok teaches the following:

[0074] This example illustrates that two mole propoxylates of acetylenic diol ethoxylates can be prepared with high selectivity when using trialkylamine catalysts. In this example, the preparation of the 7 mole propoxylate of Surfynol.RTM. 465 surfactant, which is the 10 mole ethoxylate of 2,4,7,9-tetramethyl-4-decyne-4,7-diol, was attempted. (*emphasis added*)

Concerning the Pluronic L121, Lee, Won-Mok teaches the following:

16TABLE 11 Foam Volume (mL) OCG 934 3: Time (min) Ex. 4 Ex. 31 2.sup.a MF-702.sup.b MF-319.sup.b 10R5.sup.c 17R2.sup.c L31.sup.c 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1 7.8 7.5 15.8 39.5 51.1 20.5 15.4 20.2 2 7.2 7.5 17.2 72.6 91.4

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21.1 16.2 20.5 3 7.1 7.5 24.2 107.4 135.3 22.6 16.7 21.4 4 7.2 7.5 22.9 156.4  
 176.8 21.7 16.9 21.1 5 7.2 7.5 22.3 172.8 237.8 22.3 16.5 21.4 6 7.3 7.5 22.0  
 236.2 275.1 22.6 16.9 22.3 7 7.1 7.5 25.8 287.0 321.3 22.6 16.9 21.7 8 7.1 7.5  
 25.8 307.6 372.6 22.0 17.4 22.0 9 7.1 7.5 25.5 326.9 416.7 22.9 17.2 22.0 10 7.5  
 7.5 26.2 301.3 460.6 22.6 17.4 22.3 11 7.7 7.5 26.5 340.2 502.0 22.3 17.6 22.6 12  
 7.9 7.5 26.9 404.8 544.9 22.0 17.4 22.3 13 7.8 7.5 26.9 438.6 594.7 22.6 17.8 22.6  
 14 7.9 7.5 28.9 488.6 647.5 22.0 17.6 22.3 15 7.8 7.5 27.3 514.9 681.1 22.3 18.1  
 22.6 .sup.aCommercial developer solution from Olin (now Arch Chemical)  
 .sup.bCommercial developer marketed under Microposist .RTM. trademark by  
 Shipley .sup.cCommercial surfactant marketed under Pluronic .RTM. trademark  
 by BASF (*emphasis added*)

Concerning the deionized water, Lee, Won-Mok teaches the following:

[0098] Solutions in **distilled water** of the materials of Examples 37-52 were prepared and their surface tension and foam performance were evaluated as in the example above. The results are set forth in the Table 7. (*emphasis added*)

Concerning the aqueous solvent and the methanol, Lee, Won-Mok teaches the following:

[0056] To prepare the EO/PO adducts of the invention, the acetylenic glycol is liquefied by melting and the catalyst is added with stirring. Ethylene oxide and/or propylene oxide are added as liquids with stirring and the reaction is concluded when the desired polyalkylene oxide chain length is reached as determined by gel permeation chromatography (GPC), high performance liquid chromatography (HPLC), nuclear magnetic resonance (NMR), cloud point (ASTM D2024-65) or water titration of an **isopropyl alcohol** solution. No solvents are necessary during the reaction, but inert solvents such as aromatic hydrocarbons (benzene and toluene) and ethers (ethyl ether) may be used to facilitate handling. In some instances It may be convenient to use a low mole ethoxylated acetylenic diol, since these products are liquids and are therefore easy to handle. (*emphasis added*)

Concerning the preferred solvents, Lee, Won-Mok teaches the following:

[0016] JP 03063187 A discloses the use of acetylenic glycol ethylene oxide and/or propylene oxide addition products in concentrated aqueous fountain solution compositions for offset printing. In one example, the 8 to 12 mole ethylene oxide/1 to 2 mole propylene oxide adduct of 3,5-dimethyl-4-octyne-3,5-diol is used in a fountain solution. Other xamples illustrate the use of only ethylene oxide derivatives of acetylenic **diols**. (*emphasis added*)

Concerning the TMAH, Lee, Won-Mok teaches the following:

[0107] Foam tests were made in **TMAH** developer solutions formulated with the EO/PO adduct of Example 4 and the EO adduct of Example 31 as surfactants and with six commercial developer solutions containing surfactants. Data were collected utilizing a foam generating apparatus whereby nitrogen gas was passed through a frit and bubbled through 100 mL of the solutions at 50 mL/min. Except

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for the commercial developer solutions which were used as received, all solutions contained 2.4 wt % **TMAH** in water with enough surfactant to lower surface tension to 4-43 dyne/cm. The results are given in Table 11. (*emphasis added*)

Concerning the 2,4,7,9-tetramethyl-5-decyne-4,7-diol, Lee, Won-Mok teaches the following:

[0079] Example 3 illustrates the preparation of the 3.5 mole ethoxylate of **2,4,7,9-tetramethyl-5-decyne-4,7-diol** capped with 2 moles of propylene oxide using trimethylamine catalyst and a preformed ethoxylate. The 3.5 mole ethoxylate of **2,4,7,9-tetramethyl-5-decyne-4,7-diol** is commercially available from Air Products and Chemicals, Inc. and is marketed as Surfynol.RTM. 440 surfactant. (*emphasis added*)

13. Claims 17-32 rejected under 35 U.S.C. 102(e) as being anticipated by Barber, Leslie Cox (US20050176605).

Concerning the reducing defects, acetylenic diol, rinsing and the deionized water, Barber, Leslie

Cox teaches the following:

[0131] The **substrate** was processed in the same manner as the deionized **rinse** comparison using the same developer and process conditions. However, after 100 seconds of developing, a process solution comprising an **acetylenic diol** surfactant (example 61)--rather than **deionized water**--was used to **rinse** the patterned photoresist-coated surface. The overlapping period with the developer was the same as in comparative example 3. After a 120 second **rinse** with the process solution, a DI water **rinse** was used for another 7 minutes. The **substrate** was inspected for **defects** using the TereStar.RTM. KLA-Tencor defect inspection tool and the **defects** were classified and counted. The results of the inspection are provided in Table 12. (*emphasis added*)

Concerning the semiconductor devices, photoresist and the radiation source to form, Barber, Leslie Cox teaches the following:

[0005] The drive to reduce defects--thereby improving yield--presents new challenges to the manufacturing steps within the production of the **semiconductor** device, namely, the lithography, etching, stripping, and chemical-mechanical planarization (CMP) processes. The lithography process generally involves coating a substrate with a positive or negative **photoresist**, exposing the substrate to a **radiation** source to provide an image, and developing the substrate to form a **patterned photoresist** layer on the substrate. This **patterned** layer acts as a mask for subsequent substrate **patterning** processes such as etching, doping, and/or coating with metals, other **semiconductor** materials, or insulating materials. The etching process generally involves removing the surface of the substrate that is



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not protected by the **patterned photoresist** using a chemical or plasma etchant thereby exposing the underlying surface for further processing. The stripping process generally involves removing the cross-linked, **photoresist pattern** from the substrate via wet stripping or oxygen plasma ashing. The CMP process generally involves polishing the surface of the substrate to maintain flatness during processing. All of the aforementioned processes typically employ a rinse step to remove any particulate material that is generated from, or is a by-product of, these processes. (*emphasis added*)

Concerning the exemplified surfactant, developer solution, TMAH and the 2,4,7,9-tetramethyl-4,7-decane diol, Barber, Leslie Cox teaches the following:

[0136] Example process solutions were prepared by adding 0.05 weight percent of **2,4,7,9-tetramethyl-4,7-decane diol** to deionized water under continuous stirring. A substrate was processed in the following manner: a silicon wafer provided by Wafernet, Inc. and coated with an anti-refeective coating was coated with a TOK 6063 193 nm photoresist and exposed to a 193 nm light with a ASML PAS 5500/1100 scanner, heated to a temperature of approximately 115.degree. C. for a time of about 1 minute, and then developed to form a patterned photoresist with a dilute **TMAH** solution. The **TMAH developer solution** was applied by dynamically dispensing a 0.26N **TMAH** solution onto the substrate and allowed to set for a period of 45 seconds. The process solution was then dynamically dispensed onto the substrate surface while the wafer substrate slowly spun at 500 rpm to distribute the solution on the substrate surface. The dispense process lasted for a period of 15 seconds. Afterwards, the substrate was spun at 3,500 rpm to dry. (*emphasis added*)

Concerning the Pluronic L121, Barber, Leslie Cox teaches the following:

[0070] The dispersant may be an ionic or a nonionic compound. The ionic or nonionic compound may further comprise a copolymer, an oligomer, or a surfactant, alone or in combination. The term copolymer, as used herein, relates to a polymer compound consisting of more than one polymeric compound such as block, star, or grafted copolymers. Examples of a nonionic copolymer dispersant include polymeric compounds such as the tri-block EO-PO-EO co-polymers PLURONIC.RTM. **L121, L123, L31, L81, L101** and P123 (BASF, Inc.). The term oligomer, as used herein, relates to a polymer compound consisting of only a few monomer units. Examples of ionic oligomer dispersants include SMA.RTM. 1440 and 2625 oligomers (Elf Alfochem). (*emphasis added*)

Concerning the Triton X-114, Barber, Leslie Cox teaches the following:

[0071] Alternatively, the dispersant may comprise a surfactant. If the dispersant comprises a surfactant, the surfactant may be ionic (i.e., anionic, cationic) or nonionic. Further examples of surfactants include silicone surfactants, poly(alkylene oxide) surfactants, and fluorochemical surfactants. Suitable non-ionic surfactants for use in the process solution include, but are not limited to, octyl and nonyl phenol ethoxylates such as TRITON.RTM. **X-114, X-102, X-45,**

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**X-15** and alcohol ethoxylates such as BRIJ.RTM. 56 (C.sub.16H.sub.33(OCH.sub.2CH.sub.2).sub-.10OH) (ICI), BRIJ.RTM. 58 (C.sub.16H.sub.33(OCH.sub.2CH.sub.2).sub.20OH) (ICI). Still further exemplary surfactants include alcohol (primary and secondary) ethoxylates, amine ethoxylates, glucosides, glucamides, polyethylene glycols, poly(ethylene glycol-co-propylene glycol), or other surfactants provided in the reference McCutcheon's Emulsifiers and Detergents, North American Edition for the Year 2000 published by Manufacturers Confectioners Publishing Co. of Glen Rock, N.J. (*emphasis added*)

Concerning the aqueous solvent, non-aqueous solvent and the methanol, Barber, Leslie Cox teaches the following:

[0066] In certain embodiments, the process solution may contain at least one **non-aqueous solvent** that is miscible in an **aqueous solvent** or is water-miscible. In these embodiments, the amount of **non-aqueous solvent** within the process solution may range from about 1 to about 50% by weight with the balance of the solvent within the process solution comprising an **aqueous solvent**. Examples of water-miscible **non-aqueous solvents** include **methanol, ethanol, isopropyl alcohol, and THF**. (*emphasis added*)

Concerning the preferred solvents, Barber, Leslie Cox teaches the following:

[0065] In embodiments where a non-aqueous solvent is used in addition to or in place of an aqueous solvent such as water, the non-aqueous solvent selected will preferably not react with the alkoxyated acetylenic diol surfactant contained therein, other additives within the process solution, or the substrate itself. Suitable solvents include, but are not limited to, hydrocarbons (e. g. **pentane** or **hexane**); **halocarbons** (e. g. **Freon 113**); **ethers** (e. g. **ethylether** (Et.sub.2O), **tetrahydrofuran** ("THF"), **ethylene glycol monomethyl ether**, or **2-methoxyethyl ether (diglyme)**); nitriles (e. g. CH.sub.3CN); or aromatic compounds (e.g. benzotrifluoride). Still further exemplary solvents include **lactates, pyruvates, and diols**. These solvents include, but are not limited to, **acetone, 1,4-dioxane, 1,3-dioxolane, ethyl acetate, cyclohexanone, acetone, 1-methyl-2-pyrrolidone (NMP), and methyl ethyl ketone**. Other solvents, include **dimethylformamide, dimethylacetamide, N-methyl pyrrolidone, ethylene carbonate, propylene carbonate, glycerol** and derivatives, **naphthalene** and substituted versions, **acetic acid anhydride, propionic acid and propionic acid anhydride, dimethyl sulfone, benzophenone, diphenyl sulfone, phenol, m-cresol, dimethyl sulfoxide, diphenyl ether, terphenyl, and the like**. Still further solvents include **propylene glycol propyl ether (PGPE), methanol, ethanol, 3-heptanol, 2-methyl-1-pentanol, 5-methyl-2-hexanol, 3-hexanol, 2-heptanol, 2-hexanol, 2,3-dimethyl-3-pentanol, propylene glycol methyl ether acetate (PGMEA), ethylene glycol, isopropyl alcohol (IPA), n-butyl ether, propylene glycol-n-butyl-ether (PGBE), 1-butoxy-2-propanol, 2-methyl-3-pentanol, 2-methoxyethyl acetate, 2-butoxyethanol, 2-ethoxyethyl acetoacetate, 1-pentanol, and propylene glycol methyl ether**. The non-aqueous solvents enumerated above

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may be used alone or in combination with two or more solvents. (*emphasis added*)

Concerning the 2,4,7,9-tetramethyl-5-decyne-4,7-diol, Barber, Leslie Cox teaches the following:

[0094] Example 3 illustrates the preparation of the 3.5 mole ethoxylate of **2,4,7,9-tetramethyl-5-decyne-4,7-diol** capped with 2 moles of propylene oxide using trimethylamine catalyst and a preformed ethoxylate. The 3.5 mole ethoxylate of **2,4,7,9-tetramethyl-5-decyne-4,7-diol** is commercially available from Air Products and Chemicals, Inc. and is marketed as Surfynol.RTM. 440 surfactant. (*emphasis added*)

14. Claims 17-32 rejected under 35 U.S.C. 102(e) as being anticipated by Marsella, John Anthony (US7078358).

Concerning the semiconductor devices, Marsella, John Anthony teaches the following:

This approach is superior to that known in the art because it reduces the level of VOCs and NVRs at the same time in the cleaning formulation, which parameters are typically thought to be mutually inconsistent goals. Reduced VOC would typically be thought to result in greater NVR, while lessened NVR would typically be thought to increase VOC. Reduction in both these parameters is the unexpected result of the present invention. This is particularly critical to the electronics fabrication industry, such as in the production of **semiconductor** materials, silicon crystal growing, electronic device fabrication, optical fiber production, integrated circuit production and circuit board fabrication, assembly and packaging. (*emphasis added*)

Concerning the acetylenic diol, rinsing and the preferred solvents, Marsella, John Anthony teaches the following:

A prewetted cleaning wipe for cleaning surfaces and having low volatile organic chemical and low nonvolatile residue properties comprising a wipe **substrate** wetted with an aqueous solution of high purity water and an effective amount of an acetylenic alcohol surface active agent. The surface active agent is preferably an **acetylenic diol**. Preferred **acetylenic diols** include dimethyl octynediol and tetramethyl decynediol.

(*emphasis added*)

Concerning the exemplified surfactant, Marsella, John Anthony teaches the following:

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The acetylenic diols of the present invention include dimethyl octynediol, (Surfynol 82); tetramethyl decynediol (Surfynol 104); 2,6,9,13-tetramethyl-2,12-tetradecadien-7-yne-6-9-diol; 2,6,9-trimethyl-2-decen-7-yne-6-9-diol; 7,10-dimethyl-8-hexadecyne-7,10-diol; 2,4,7,9-tetramethyl-5-decyne-4,7-diol; 4,7-dimethyl-5-decyne-4,7-diol; 3,6-diethyl-4-octyne-3,6-diol; 2,5-dicyclopropyl-3-hexyne-2,5-diol; 2,5-diphenyl-3-hexyne-2,5-diol; **2,5,8,11-tetramethyl-6-dodecyne-5,8-diol**. (*emphasis added*)

Concerning the exemplified second surfactant, 2,4,7,9-tetramethyl-5-decyne-4,7-diol, 3,5-dimethyl-1-hexyn-3-ol and the dimethyl-1-hexyn-3-ol, Marsella, John Anthony teaches the following:

11. The cleaning wipe of claim 4 wherein the acetylenic diol is selected from the group consisting of: dimethyl octynediol; tetramethyl decynediol; 2,6,9,13-tetramethyl-2,12-tetradecadien-7-yne-6-9-diol; 2,6,9-trimethyl-2-decen-7-yne-6-9-diol; 7,10-dimethyl-8-hexadecyne-7,10-diol; **2,4,7,9-tetramethyl-5-decyne-4,7-diol**; 4,7-dimethyl-5-decyne-4,7-diol; 3,6-diethyl-4-octyne-3,6-diol; 2,5-dicyclopropyl-3-hexyne-2,5-diol; 2,5-diphenyl-3-hexyne-2,5-diol; 3,5-**dimethyl-1-hexyn-3-ol**, 2,5,8,11-tetramethyl -6-dodecyne-5,8-diol and mixtures thereof. (*emphasis added*)

Concerning the deionized water, Marsella, John Anthony teaches the following:

1. A prewetted cleaning wipe for cleaning surfaces in an electronic materials fabricating area having a low volatile organic chemical content in the range of 0.001% to 0.5% by weight and low nonvolatile residue property of at least 1.times.10.sup.-4 torr at 25.degree. C. comprising; a woven fibrous polyester/cellulose wipe substrate wetted with an aqueous solution consisting essentially of high purity water selected from the group consisting of **distilled water** and **deionized water**, and from 0.001% to 0.5% by weight of an acetylenic diol surface active agent selected from the group consisting of dimethyl octynediol, tetramethyl decynediol and mixtures thereof. (*emphasis added*)

Concerning the aqueous solvent and the methanol, Marsella, John Anthony teaches the following:

The present invention is directed to the use of completely volatile high surface active wetting agents with ultrapure water prewetted on a wiper. Table 1 shows the efficacy of various acetylenic alcohols and preferably diols, such as Surfynol 61, 82 and 104 available from Air Products and Chemicals, Inc. of Allentown, Pa., in reducing the surface tension of water, which provides the necessary wetting for cleaning applications. Much lower quantities of these agents are needed to reduce the surface tension than is the case for **isopropyl alcohol**. For comparison, the surface tension of 4 wt % IPA is 50 dynes/cm (J. Liq. Chrom. Vol.10,1987, pp 561 581). (*emphasis added*)

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Claims 17-32 rejected under 35 U.S.C. 102(b) as being anticipated by Honda, Kenji (US6033993).

Concerning the semiconductor devices and the photoresist, Honda, Kenji teaches the following:

As defined herein, the term "**photoresist stripping**" refers to chemical steps or processes that remove **photoresist** or other similar organic polymeric material from a **semiconductor** substrate. The term "plasma etch residue cleaning" refers to chemical steps or processes that remove residual materials (also sometimes called sidewall polymers) from a **semiconductor** substrate that has been subjected to plasma etching. In general, both **photoresist stripping** and plasma etch residue cleaning may leave residual solvents on the **semiconductor** substrate surface that result in corrosion of the metal layer of the **semiconductor** substrate in contact with water if not removed completely by a subsequent rinsing step. As defined herein, the term "non-corrosive" refers to the suppression of any chemical action that gradually wears away a substrate. As used herein, the term "water soluble organic acid" refers to those organic acids that are substantially dissolved in water. (*emphasis added*)

Concerning the exemplified surfactant, Honda, Kenji teaches the following:

Various other ingredients known to those skill in the art may optionally be included in the rinsing composition e.g. dyes or colorants, wetting agents, surface-active agents, antifoamers and so forth. One useful family of surface-active agents referred to as "**SURFYNOL**" 400 series surfactants (e.g., **SURFYNOL 420** (ethoxylated tetramethyl decynediols)) are commercially available from Air Products Inc. The use of a water-soluble organic acid with a water-soluble surface-active agent in a rinse solution composition is disclosed and claimed in assignees' copending U.S. Patent Application Docket No. 101726-100 filed the same day as this U.S. Patent Application. Generally, the amount of each of these optional ingredients would be about 0.0001-0.1% by weight, based on the total weight of the rinsing composition. (*emphasis added*)

Concerning the radiation source to form and the rinsing, Honda, Kenji teaches the following:

A **substrate**, such as a silicon wafer on which a thin film of oxide is formed is uniformly coated with a photoresist composition in the form of a solution followed by drying to form a photosensitive layer which is then subjected to **patterning** by **pattern**-wise exposure to light, development treatment, and post-exposure baking to give a **patterned** photoresist layer. The oxide film on the **substrate** surface is selectively etched with the **patterned** photoresist layer as a mask and then the **patterned** photoresist layer is completely dissolved away from the **substrate** surface by chemical stripping or plasma etching. Any remaining chemical stripper or plasma etch residue is removed by a **rinsing step** using the composition of the invention. (*emphasis added*)

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Concerning the developer solution and the TMAH, Honda, Kenji teaches the following:

A new class of product called "cleaner solutions" has been developed for removing these post-etch residues, particularly the metal oxide type. These cleaners have generally been described as aqueous solutions of amines or ammonium salts that contain one or more corrosion inhibitors. See U.S. Pat. No. 5,612,304 (Honda et al.). Moreover, alkaline aqueous **developers** such as those containing **tetramethylammonium** hydroxide (**TMAH**) are known to attack aluminum. Thus, aluminum oxide-type residues can be etched away with **TMAH**. However, other types of the post-etch residues, e.g., metal fluorides such as AlF<sub>3</sub> cannot be so easily removed with **TMAH** without metal layer corrosion. **TMAH** also is ineffective on residues from polysilicon plasma etch processes. (*emphasis added*)

Concerning the deionized water, Honda, Kenji teaches the following:

The same wafers prepared in the Example above were processed identically, except two **deionized water** rinses were performed following the photoresist stripping step instead of a post-strip rinse followed by a DI water rinse. (*emphasis added*)

Concerning the aqueous solvent and the methanol, Honda, Kenji teaches the following:

The described non-corrosive rinse composition is used as a replacement for conventional organic solvents, such as **isopropyl alcohol**, employed in rinse steps following photoresist stripping or plasma etch residue cleaning. The general procedure for preparing a semiconductor substrate in accordance with the method of the invention is as follows: (*emphasis added*)

Concerning the preferred solvents, Honda, Kenji teaches the following:

6. The process of claim 4, wherein said water-soluble organic acid is selected from the group consisting of lactic acid, tartaric acid, **acetic acid**, gluconic acid and phthalic acid. (*emphasis added*)

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory E. Webb whose telephone number is 571-272-1325. The examiner can normally be reached on 9:00-17:30 (m-f).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglass McGinty can be reached on (571)272-1029. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Gregory E. Webb  
Primary Examiner  
Art Unit 1751

gew